

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Original): A character recognition method for carrying out a character recognition using a cross section sequence graph which describes features of a character image, comprising the steps of:

- (a) extracting the cross section sequence graph from a character string image;
- (b) analyzing a singular region of the cross section sequence graph and generating a virtual boundary point sequence in the singular region based on an analyzed result;
- (c) generating character candidates by combining structural elements of the cross section sequence graph and recognizing one character by supplying the virtual boundary point sequence with respect to the generated character candidates if necessary; and
- (d) recognizing a character string based on an adjacency relationship of the character candidates which are recognized as one character in said step (c).

Claim 2 (Original): The character recognition method as claimed in claim 1, wherein the singular region in which the virtual boundary point sequence is generated includes a region where character string is closely adjacent or in contact.

Claim 3 (Original): The character recognition method as claimed in claim 1, further comprising the step of:

- (e) determining a generating position of the virtual boundary point sequence based on the singular region and a connecting sequence and positions of cross section sequences connecting to the singular region.

Claim 4 (Original): The character recognition method as claimed in claim 1, wherein said step (b) refers to a direction of the character string when generating the virtual boundary point sequence and generating no virtual boundary point sequence between cross section sequences not corresponding to the direction of the character string.

Claim 5 (Original): The character recognition method as claimed in claim 1, wherein said step (b) generates the virtual boundary point sequence using a predetermined curve generating method.

Claim 6 (Original): The character recognition method as claimed in claim 1, further comprising the step of:

(e) dividing the structural elements into first and second layers and managing the first and second layers by tags.

Claim 7 (Original): The character recognition method as claimed in claim 6, wherein the first layer of the structural elements include the cross section sequences and the singular region, and said step (e) manages the cross section sequences by a first tag and manages the singular region by a second tag.

Claim 8 (Original): The character recognition method as claimed in claim 7, wherein the second layer of the structural elements include boundary point sequences, and said step (e) manages the boundary point sequences by a third tag.

Claim 9 (Original): The character recognition method as claimed in claim 8, wherein said step (e) manages a blank region between characters of the character string by a fourth tag.

Claim 10 (Original): The character recognition method as claimed in claim 9, wherein said step (c) generates the character candidates by combining the first, second, third and fourth tags, and said step (e) manages the generated character candidates by a fifth tag.

Claim 11 (Original): The character recognition method as claimed in claim 10, wherein said step (c) eliminates an overlap of tags when combining the first, second and third tags, by using either one of the tag of the first layer and the tag of the second layer, with respect to identical structural elements.

Claim 12 (Original): The character recognition method as claimed in claim 10, wherein said step (d) recognizes the character string by generating links among fifth tags, generating paths among generated links, and selecting an optimum path of the generated paths.

Claim 13 (Original): A computer-readable storage medium which stores a program for causing a computer to carry out a character recognition, said program comprising:

means for causing the computer to extract from a character string image, cross section sequences and a singular region of a first layer of a cross section sequence graph, and boundary point sequence of a second layer of the cross section sequence graph;

means for causing the computer to generate character candidates by combining the cross section sequences, the singular region and the boundary point sequences;

means for causing the computer to recognize one character with respect to the generated character candidates; and

means for causing the computer to recognizing a character string based on an adjacency relationship of the character candidates which are recognized as one character.

Claim 14 (Original): The computer-readable storage medium as claimed in claim 13, wherein the program further comprises:

means for causing the computer to analyze the singular region and generating a virtual boundary point sequence in the singular region based on an analyzed result of the singular region; and

means for causing the computer to convert the character candidates made up of the cross section sequences and the singular region into boundary point sequences by supplying the virtual boundary point sequence if necessary when recognizing one character.

Claim 15 (Original): The computer-readable storage medium as claimed in claim 14, wherein the program further comprises:

means for generating a first tag for managing the cross section sequences, a second tag for managing the singular region, a third tag for managing the boundary point sequences, and a fourth tag for managing a blank within the character string.

Claim 16 (Original): The computer-readable storage medium as claimed in claim 15, wherein the program further comprises:

means for causing the computer to generating a fifth tag for managing character candidates which are generated by combining the first, second, third and fourth tags.

Claim 17 (Original): The computer-readable storage medium as claimed in claim 16, wherein the program further comprises:

means for causing the computer to managing the first, second, third and fifth tags by identical logic structures.

Claim 18 (Original): A computer-readable storage medium which stores a program for causing a computer to carry out a character recognition using a cross section sequence graph which describes features of a character image, said program comprising the steps of:

- (a) causing the computer to extract the cross section sequence graph from a character string image;
- (b) causing the computer to analyze a singular region of the cross section sequence graph and generating a virtual boundary point sequence in the singular region based on an analyzed result;
- (c) causing the computer to generate character candidates by combining structural elements of the cross section sequence graph and recognize one character by supplying the virtual boundary point sequence with respect to the generated character candidates if necessary; and
- (d) causing the computer to recognize a character string based on an adjacency relationship of the character candidates which are recognized as one character in said step (c).

Claim 19 (Currently Amended): A character recognition apparatus for carrying out a character recognition using a cross section sequence graph which describes features of a character image, comprising:

an extracting unit ~~extracting~~ configured to extract the cross section sequence graph from a character string image;

an analyzing unit ~~analyzing~~ configured to analyze a singular region of the cross section sequence graph and ~~generating to generate~~ a virtual boundary point sequence in the singular region based on an analyzed result;

a generating unit ~~generating~~ configured to generate character candidates by combining structural elements of the cross section sequence graph and ~~recognizing to recognize~~ one character by supplying the virtual boundary point sequence with respect to the generated character candidates if necessary; and

a recognizing unit ~~recognizing~~ configured to recognize a character string based on an adjacency relationship of the character candidates which are recognized as one character in said generating unit.

Claim 20 (New): A character recognition apparatus for carrying out a character recognition using a cross section sequence graph which describes features of a character image, comprising:

means for extracting the cross section sequence graph from a character string image;

means for analyzing a singular region of the cross section sequence graph and for generating a virtual boundary point sequence in the singular region based on an analyzed result;

means for generating character candidates by combining structural elements of the cross section sequence graph and for recognizing one character by supplying the virtual boundary point sequence with respect to the generated character candidates if necessary; and

means for recognizing a character string based on an adjacency relationship of the character candidates which are recognized as one character in said means for generating.